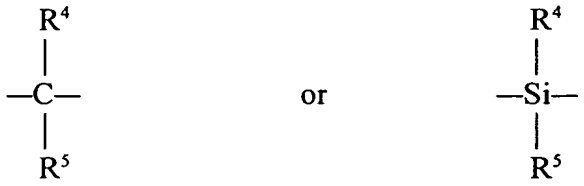
WHAT IS CLAIMED IS:

1. A process for the polymerization of α-olefin to provide a liquid plyalphaolefin homo- or copolymer, the process comprising polymerizing at least one olefin in the presence of hydrogen and a catalytically effective amount of catalyst comprising the product obtained by combining a metallocene procatalyst with a cocatalyst, the metallocene procatalyst being at least one compound of general formula:

$$(Cp^1R^1_m)R^3(Cp^2R^2_p)MX_q$$

wherein Cp^1 of ligand $(Cp^1R^1_m)$ and Cp^2 of ligand $(Cp^2R^2_p)$ are the same or different cyclopentadienyl rings, R^1 and R^2 each is, independently, hydrogen or a hydrocarbyl, halocarbyl, heterocarbyl, hydrocarbyl-substituted organometalloid or halocarbyl-substituted organometalloid group containing up to about 20 carbon atoms, m is 0 to 5, p is 0 to 5 and two R^1 and/or R^2 substituents on adjacent carbon atoms of the cyclopentadienyl ring associated therewith can be joined together to form a ring containing from 4 to about 20 carbon atoms, R^3 is a bridging group bridging Cp^1 with Cp^2, M is a transition metal having a valence of from 3 to 6, each X is a non-cyclopentadienyl ligand and is, independently, halogen or a hydrocarbyl, oxyhydrocarbyl, halocarbyl, hydrocarbyl-substituted organometalloid, oxyhydrocarbyl-substituted organometalloid or halocarbyl-substituted organometalloid group containing up to about 20 carbon atoms, and q is equal to the valence of M minus 2, the cocatalyst being an aluminoxane and it being provided that ligand $(Cp^1R^1_m)$ is different than ligand $(Cp^2R^2_p)$ and bridging group R^3 contains at least two bulky groups.

2. The process of Claim 1 wherein in the metallocene procatalyst, bridging group R^3 possesses the structure



in which groups R^4 and R^5 each, independently, is, or contains, a cyclic group of from 6 to about 20 carbon atoms, from 0 to 3 heteroatoms and hydrogen as the remaining atoms.

3. The process of Claim 2 wherein in the metallocene procatalyst, the cyclic group is a cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, heteroaryl, alkaryl, alkylheteroaryl, aralkyl or heteroaralkyl group.

4. The process of Claim 3 wherein in the metallocene procatalyst, ligand ($Cp^1R_m^1$) is unsubstituted cyclopentadienyl, ligand ($Cp^2R_p^2$) is substituted or unsubstituted indenyl or fluorenyl, M^1 is zirconium, R^4 and R^5 each is phenyl and each ligand X is chlorine.

5. The process of Claim 1 wherein the metallocene procatalyst based in terms of the transition metal M, is present in an amount from 0.0001 to about 0.02 millimoles/liter and the aluminoxane cocatalyst is present in an amount from 0.01 to about 100 millimoles/liter.

6. The process of Claim 1 wherein the α-olefin contains from 2 to about 20 carbon atoms.

7. The process of Claim 1 wherein the α-olefin contains from about 6 o about 12 carbon atoms

8. The process of Claim 1 wherein the α-olefin is 1-decene.

9. The process of Claim 1 wherein the metallocene procatalyst is combined with the aluminoxane cocatalyst and hydrogen in any order thereof and in the presence or absence of α-olefin.

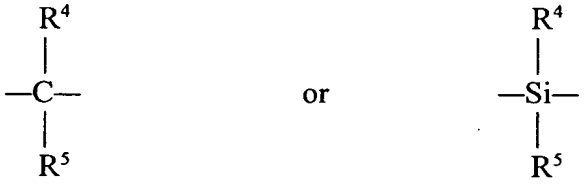
10. A liquid polyalphaolefin homo- or copolymer obtained from the polymerization of at least one α-olefin having from 2 to about 12 carbon atoms, the process comprising polymerizing the monomer in the presence of hydrogen and a catalytically effective amount of a catalyst comprising the product obtained by combining a metallocene procatalyst with a cocatalyst, the metallocene procatalyst being at least one compound of general formula:

$$(Cp^1R^1_m)R^3(Cp^2R^2_p)MX_q$$

wherein Cp^1 of ligand $(Cp^1R^1_m)$ and Cp^2 of ligand $(Cp^2R^2_p)$ are the same or different cyclopentadienyl rings, R^1 and R^2 each is, independently, hydrogen or a hydrocarbyl, halocarbyl, hydrocarbyl-substituted organometalloid or halocarbyl-substituted

organometalloid group containing up to about 20 carbon atoms, m is 0 to 5, p is 0 to 5 and two R^1 and/or R^2 substituents on adjacent carbon atoms of the cyclopentadienyl ring associated therewith can be joined together to form a ring fused to the cyclopentadienyl ring, the fused ring containing from 4 to about 20 carbon atoms, R^3 is a bridging group bridging Cp^1 and Cp^2, M is a transition metal having a valence of from 3 to 6, each X is a non-cyclopentadienyl ligand and is, independently, halogen or a hydrocarbyl, oxyhydrocarbyl, halocarbyl, hydrocarbyl-substituted organometalloid, oxyhydrocarbyl-substituted organometalloid or halocarbyl-substituted organometalloid group containing up to about 20 carbon atoms, q is equal to the valence of M minus 2, the cocatalyst being an aluminoxane and it being provided that ligand ($Cp^1R^1_m$) is different from ligand ($Cp^2R^2_p$) and bridging group R^3 contains at least two bulky groups.

11. The polyalphaolefin of Claim 10 wherein bridging group R^3 possesses the structure



in which groups R^4 and R^5 each, independently, is, or contains, a cyclic group of from 6 to about 20 carbon atoms, from 0 to 3 heteroatoms and hydrogen as the remaining atoms.

12. The polyalphaolefin of Claim 11 wherein in the metallocene procatalyst, the cyclic group is a cycloalkyl, heterocycloalkyl, cycloalkenyl, heterocycloalkenyl, aryl, heteroaryl, alkaryl, alkylheteroaryl, aralkyl or heteroaralkyl group.

13. The polyalphaolefin of Claim 12 wherein in the metallocene procatalyst, ligand ($Cp^1R_m^1$) is unsubstituted cyclopentadienyl, ligand ($Cp^2R_p^2$) is substituted or unsubstituted indenyl or fluorenyl, M^1 is zirconium, R^4 and R^5 each is phenyl and each ligand X is chlorine.

14. The polyalphaolefin of Claim 10 wherein the metallocene procatalyst is combined with hydrogen and the cocatalyst in any order thereof in the presence or absence of monomer.

15. The polyalphaolefin of Claim 11 wherein the metallocene procatalyst is combined with hydrogen and the cocatalyst in any order thereof in the presence or absence of monomer.

16. The polyalphaolefin of Claim 12 wherein the metallocene procatalyst is combined with hydrogen and the cocatalyst in any order thereof in the presence or absence of monomer.

17. The polyalphaolefin of Claim 13 wherein the metallocene procatalyst is combined with hydrogen and the cocatalyst in any order thereof in the presence or absence of monomer.

18. The polyalphaolefin of Claim 10 wherein the monomer is 1-decene.

19. The polyalphaolefin of Claim 10 wherein polymerization is carried out under solution polymerization conditions.

20. The polyalphaolefin of Claim 10 wherein polymerization is carried out under slurry polymerization conditions.

21. The polyalphaolefin of Claim 10 possessing a M_w of from about 500 to about 80,000, a M_w/M_n of from about 1.0 to about 10, a Kv_{100} of from about 10 to about 10,000, an Iodine Number of from about 0.0 to about 10 and a T_g of below about -20°C and wherein the polyalphaolefin is substantially amorphous.

22. The polyalphaolefin of Claim 21 possessing a M_w of from about 750 to about 60,000, a M_w/M_n of from about 1.5 to about 5, a Kv_{100} of from about 20 to about 7,500, an Iodine Number of from about 0.1 to about 5 and a T_g of below about -30°C and wherein the polyalphaolefin is substantially amorphous.

23. The polyalphaolefin of Claim 22 possessing a M_w of from about 1,000 to about 40,000, a M_w/M_n of from about 1.75 to about 4, a Kv_{100} of from about 25 to about 5,000, an Iodine Number of from about 0.2 to about 3 and a T_g of below about -40°C and wherein the polyalphaolefin is substantially amorphous.

24. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 10.

25. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 13.

26 ~~27~~. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 18.

27 ~~28~~. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 20.

28 ~~30~~. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 21.

29 ~~31~~. A lubricating oil composition comprising a lubricating oil and a viscosity-modifying amount of the liquid polyalphaolefin of Claim 22.

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~~32~~. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 10.

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~~33~~. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 13.

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~~34~~. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 18.

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~~35~~. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 20.

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~~36~~. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 21.

~~31~~ 35. A method for improving the viscosity index of a lubricating oil composition comprising adding to the composition a viscosity-modifying amount of the liquid polyalphaolefin of Claim 22.